Office of Resource Conservation

State of Illinois

Grant Proposal

Project Number: **T-109-R-1**

Project Title: **Smooth Green Snake Project**

Need:

Historically, smooth green snakes (*Opheodrys vernalis*) were once a common species in the Illinois landscape. However, urban development, agricultural practices, pesticides, and habitat fragmentation have dramatically reduced their numbers. The Illinois Wildlife Action Plan has identified the smooth green snakes as a Species in Greatest Need of Conservation for Illinois. The criterion for the designation includes the small population size, the significant decline from historic levels, and that the species status is poorly understood from available information.

Currently, the distribution and geographic location of individual populations of smooth green snakes is incomplete and sporadic. It is believed that their populations may be restricted to isolated, graminoid-dominated remnants. Although conservation efforts in Illinois have restored available habitat, smooth green snakes populations remain low. They have limited potential for natural recolonization due to habitat fragmentation and the small dispersal range of smooth green snakes, which may be less than 40 meters (Sacerdote-Velat, 2014). Augmenting existing populations and reintroducing populations by head-starting young may increase and expand populations. Head-starting is a conservation technique that improves the survival rate of a species by accelerating growth rate and increasing body size of captive born young. The young are then either soft-released or hard-released into a carefully chosen site. Knowing the geographic locations of current populations of smooth green snake populations is a critical first step in the recovery of this species.

McHenry County Conservation District partnered with Lincoln Park Zoo in 2013 and 2014 to survey for smooth green snakes on District sites and to establish a head-starting program for the young. The goal of the project was to identify the geographic locations of snake populations and to augment those existing populations by head-starting young at Lincoln Park Zoo facilities. The first year of the project (2013) a total of four smooth green snakes were found; none of which were gravid females. The second year (2014) was more positive with 24 individual smooth green snakes located, two of which were gravid females. The young from the two gravid females were head-started at Lincoln Park Zoo and are scheduled for soft-release in 2015 into a site that currently has a known smooth green snake population.

Purposes and Objectives:

The District would like to continue and expand the smooth green snake project by continued surveys in known geographic locations of smooth green snake populations that were discovered in 2013 and 2014 and increase surveys to more sites to hopefully identify other, currently unknown, populations. The District would also like to establish a head-starting program at an on-site location, specifically, its Wildlife Resource Center. The Funds approved through this grant will be used to buy equipment necessary to establish a head-starting operation at the District's Wildlife Resource Center, to expand cover-board surveys on District sites and to fund a seasonal Wildlife Technician to conduct the survey work.

Objectives:

1. Smooth green snakes will be surveyed to identify existing populations. The data collected during surveys will include, at a minimum, the species and number of snakes observed. All smooth green snakes found under cover boards will be measured, weighed, and marked to determine recapture rates. Gravid females will be transported to the District's Wildlife Resource Center where their young will be head-started.
    a. Nine sites with a total of 15 transects (5 cover boards in each transect) will be resurveyed. An additional seventeen transects will be added to these sites.
    b. Four new sites will be surveyed with a total of seven new transects.

2. All survey sites and transect locations will be mapped and the existing natural communities will be documented. Transects that have smooth green snake captures will require additional documentation including a basic plant species list, site land use history, whether it is a remnant non-remnant or a restoration area, and what management activities have taken place in that location over the past five years. This information will help provide insights into the habitat types where smooth green snakes are currently thriving. All smooth green snakes, including head-started juveniles will be individually marked with ventral scale cautery to monitor recapture rates and growth and survival of released head-started young.

3. Depending on the number of captured gravid females and head-started individuals, the new head-started young will either be used to augment known populations and/or be reintroduced into areas possessing suitable habitat characteristics.
    a. Populations will be established or supplemented on a minimum of five large grassland preserves
    b. Initially known populations on large preserves will be augmented until those populations reach at least 100 individuals.
    c. Sites will be selected for reintroducing smooth green snakes where there is suitable habitat but no known populations. Specific site selection recommendations based on habitat suitably modeling and data from 2013 and

2014 field surveys are part of a smooth green snake recovery plan researched and written for the District by Lincoln Park Zoo in 2015.

d. Additionally, the vegetation surveys at capture locations will help define a strategy for choosing the precise locations for release of head-started snakes. These parameters shall include:
    i. A commonality of forbs and grasses to those found at capture locations
    ii. A similar ratio of forbs to grasses
    iii. A similar vegetation structure, height and relative cover to those found at capture locations
    iv. Similar soil types to those found at capture location
    v. A similar proximity of geological features that were present at capture locations and are also present in potential release locations

4. The geographic locations of all smooth green snakes observed under cover boards or by visual observation will be recorded at the time of discovery and mapped in GIS by the close of each field season. This information will be incorporated into existing and future site management plans and brought forth into any future discussions of site planning and development. Management plans will be reviewed seasonally each year with on all the available information on the locations of all smooth green snake populations. Management recommendations will be redefined at the end of every survey field season using the most current population data.

Expected Results or Benefits:

Currently, the District has mapped the locations of smooth green snakes that were observed in past surveys as well as incidental observations for future reference. We expect to be able to identify and map additional populations with the expanded site surveys. The geographic information gained will be critical to our agency for site planning and amenities development and in scheduling common management practices such as rotational prescribed fire and herbiciding of problem species. This project will produce updated occurrence maps for an Illinois Species in Greatest Need of Conservation and, where recaptures permit, abundance data.

Critically, the additional data recorded with smooth green snake captures will increase our knowledge of preferred habitat including what plant species are typically found at capture sites. This information will help the District and the greater regional conservation community with geographic location decisions for future reintroductions into restored habitat.

Reintroducing smooth green snakes into restored areas that have no natural corridors to existing populations will expand their range locally. Additionally, it helps insure the species' regional fitness should local stochastic catastrophic events occur. Mark and capture data will

allow us the opportunity to evaluate the success of our augmentation and reintroduction efforts of head-started young released.

Approach:

Field Surveys:

Survey sites will include sites with current and historical recorded observations of smooth green snakes. Additional sites for surveys will be prioritized on the presence of graminoid-dominated remnants. The methods for site selection will include a review of historical and current aerial photos. Sites that currently have grassland habitat and no history of cultivation will have high priority.

Survey transects consisting of five, 2' x 2' wooden cover-boards will be put in place by late spring. A minimum of 40 transects will be surveyed. Each transect will be visited at least three times during the months of May through August when snakes are most active. All snake species observed on surveys, whether under or a cover-board or by incidental observation will be recorded. All smooth green snakes captured will be individually marked with ventral scale cautery for future identification. Morphological data such as mass, length, sex and approximate age (i.e. juvenile or adult) will be recorded for all smooth green snakes captured. At the conclusion of active cover-board surveys, smooth green snake capture locations will be surveyed for flora composition and structure.

Head-starting:

Gravid female smooth green snakes captured during surveys will be transported to the Wildlife Resource Center for oviposition. The females will be placed in 15 gallon aquariums that contain at least three inches of sphagnum moss and a variety of branches, logs, etc. Cages will be misted daily with half of the cage kept moister than the other to allow the snake a choice of humidity levels. At the conclusion of oviposition, the snake will be returned to the location of discovery and their eggs will be placed into containers filled with vermiculite (wetted at a 1:1 ratio) and moved into a Lyon incubator. Eggs will be incubated at 80 F^{o} and egg containers will be weighed once a week until hatching to assess hydration.

Two to three hatchlings will be housed in a 15 gallon glass aquarium with a secure fitting, metal screened lid. Each tank will have three inches of sphagnum moss as a substrate, with a dry side and wet side. Pieces of bark, sticks, and artificial plants will be placed in the tank to provide multiple habitat options. Tanks will be misted daily and the tank substrate will be changed every two weeks. Tanks will be disinfected monthly. Lighting from above will provide both heat and UV radiation. In addition, heat strips will be placed under the tanks to provide warmth. Lighting will consist of Sylvania black lights, fluorescent Reptisun 5.0 bulbs, and Eiko Supreme (EXT/SU 12V50W) halogen lights. These lights will stay on for 15 hours/day during

the most active months of the year (Jun-Aug) and will taper down to 11 hours/day from September to the end of December when the snakes will be brumated.

Our protocol for head-starting young smooth green snakes is based on those currently in use at Lincoln Park Zoo with the exception of their brumation strategies. Instead of brumating in artificially cool temperatures from a refrigeration unit, the District's head-started young will naturally brumate in a below ground cool environment located within the Wildlife Resource Center. This location has been used in the past to successfully brumate a number of amphibian and reptile species, including adult and juvenile Blanding's turtles. The brumation period will last 65-70 days with a week of cooling down and warming up at the start and end of this period. Snakes will emerge from brumation in early March and will begin a light cycle of 11 hours/day increasing to 15 hours/day by June.

Hatchling diet will consist of small (3/16-1/4") crickets and wax worms. Food items will be dusted with a calcium supplement six days of the week and a 1:1 vitamin D/calcium supplement one day of the week. All snakes will be weighed on a monthly basis and will be assessed for wellness and hydration on a daily basis.

Augmentation and Reintroduction:

Site selection for augmentation and reintroduction releases will be based on the geographic location and the associated habitat of smooth green snake capture data available from this project. Sites that currently have green snake populations with surrounding habitat that has been restored with similar vegetation composition will have high priority as release sites. Sites that have graminoid-dominated remnants and large areas of restored graminoid-dominated habitat but have no current records of smooth green snakes will be considered for reintroduction sites. The flora species lists and vegetation structure descriptions from smooth green capture sites will be part of the criteria used in release site selection.

Soft release structures will be used in releasing head-started individuals. Soft release allows individuals to acclimate to new habitat while limiting predation (Tuberville et al., 2005). It also facilitates monitoring.

Data:

A GIS shapefile and associated printable maps of the geographic location of each smooth green snake capture and/or sighting be produced at the end of the project. Locations of smooth green snake populations from all recently conducted surveys on District sites will be combined with the data from this project to produce updated occurrence maps for an Illinois Species in Greatest Need of Conservation.

Morphological data from field surveys and the head-starting project will be recorded. Recapture rates, if applicable, will also be recorded and mapped.

A comprehensive flora species list will be compiled at the site of each smooth green snake capture including descriptions of structure and composition. Recent management will also be noted.

Useful Life: Not applicable.

Geographic Location:

All survey locations will be on District sites. Some sites are also Illinois Nature Preserves; applicable scientific permits shall be secured. Survey site priority will be given first to sites with known green snake populations, secondly, sites with historical records of smooth green snakes, and finally, to sites with graminoid-dominated remnants but no records of green snakes.

Thirteen sites been identified as potential sites with smooth green snakes. The detailed maps of proposed survey sites and transect locations are contained in Appendixes A.

Principle Investigator:

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Email: CJablonski@MCCDistrict.org

Program Income: Not applicable.

Budget Narrative:

DETAILED PROJECT BUDGET

Project Title: Smooth Green Snake Project
Project Number: T-109-R1
Project Time Frame: Start Date - (11\1\2015); End Date - (5\1\2018)

Budget Catagories	Federal Funds	Non-Federal Funds (1)	Total
Salaries and Wages			
Administrative/Professional	$0.00	$0.00	$0.00
Academic / Graduate Hourly Wages	$11,520.00	$6,203.00	$17,723.00
Other Title	$0.00	$0.00	$0.00
Tuition Remission	$0.00	$0.00	$0.00
Fringe Benefits			
Administrative/Professional	$0.00	$0.00	$0.00
Academic / Graduate Hourly Wages	$1,624.00	$875.00	$2,499.00

Other Title	$0.00	$0.00	$0.00
Travel			
In-State			
Meals / Per Diem	$0.00	$0.00	$0.00
Lodging	$0.00	$0.00	$0.00
Mileage	$2,688.00	$1,447.00	$4,135.00
Out-of-State			
Meals / Per Diem	$0.00	$0.00	$0.00
Lodging	$0.00	$0.00	$0.00
Mileage	$0.00	$0.00	$0.00
International			
Meals / Per Diem	$0.00	$0.00	$0.00
Lodging	$0.00	$0.00	$0.00
Mileage	$0.00	$0.00	$0.00
Equipment			
	$0.00	$0.00	$0.00
Materials and Supplies			
	$9,178.00	$4,942.00	$14,120.00
Contractual Services			
	$0.00	$0.00	$0.00
Other			
	$0.00		$0.00
Total Direct Costs	$25,010.00	$13,467.00	$38,477.00
Modified Total Direct Cost (MTDC)	$25,010.00	$13,467.00	$38,477.00
Indirect Rate of 0%	$0.00		$0.00
Indirect Rate of ____ .__ %		$0.00	$0.00
Unrecovered Indirect Rate (20% vs ___ . __ % MTDC)		$0.00	$0.00
Overmatch		$0.00	$0.00
Total Project Costs	$25,010.00	$13,467.00	$38,477.00
Percentage of Total Project Cost	65.00%	35.00%	100.00%

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Equipment	$0.00	$0.00	$0.00
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Indirect Rate of ____ .__ %		$0.00	$0.00
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Total Project Costs	$25,010.00	$13,467.00	$38,477.00
Percentage of Total Project Cost	65.00%	35.00%	100.00%

Detailed Budget Justification:

Salaries and Wages	
Seasonal to check cover boards 640 hrs. at $9.00/hr. x 2 field seasons	$11,520
Fringe Benefits for Hourly Seasonal(14.1%-a combination of Social Security, Medicare, Workers Comp and Unemployment Insurance)	$1,624
Travel	
Mileage ($.56/mile) estimated 30 miles/day x 5 days/wk x 16 wks x 2 field seasons	$2,688
Subtotal	**$15,832**

Materials and Supplies

Jennings / JScale JS-300V Digital Pocket Scale x 2	$100
Cover Boards for 2 years (includes replacement costs for lost or damaged boards)	$800

GPS unit x 2	$330
Bovie Cautery Kit (x2)x 2 years (2 for each field season- these are not very durable and will most likely need replacing after one field season)	$248
Soft-Release Enclosures $200 x 2 years	$400
Field equipment Subtotal	**$1,878**
10- 15 gal. aquarium $40 ea. (Up to 10 tanks)	$400
10 aquarium lids $10 ea (Up to 10 tanks)	$100
Wire shelving units to hold aquariums from Menards $62 ea. (4 units)	$248
Track lighting, 3 light kit from Menards $27 ea. (6 units) = $162	$162
Metalux 3' T8 flourescent strip light fixture $12 ea. (4 units) = $48	$48
8 black light bulbs $8 per bulb= $64 x 2 years	$128
Reptisun 10.0 UVB 36" fluorescent bulb $30 ea. (12 bulbs) = $360 x 2years	$720
Big Apple Digital Thermometer and Humidity Gauge (dual probe) $25 ea. (up to 10)	$250
Lyons RL-1 Reptile Incubator (120 VAC) $800 ea. (2 incubators)	$1,600
Head-starting Equipment Costs:	$3,656
3/4 inch crickets 1000 per week ($11.50) = $598 x 2 years	$1,196
1/8 inch crickets 2000 per week ($23) = $1,196 x 2 years	$2,392
Wax worms & materials to start reproduction program = $28 x 2 years	$56
Head-starting Feeding Costs:	$3,644
Head-starting Subtotal	**$7,300**
Total:	**$25,010**
In-Kind Service: 328.46 District Personnel Hours at $20.50 x 2 years =	$13,467
Total Project Match through in-kind services:	**$13, 467**
Total Project Cost	**$38,477**

Multipurpose Projects: Not applicable.

Relationship with Other Grants:

Currently, Glacial Park, one of the proposed survey sites and location of several discrete smooth green snake populations, is undergoing extensive restoration funded by a US Army Corps of Engineers Section 206 Grant, W912P6-14-C-0027. The restoration activities include large scale clearing of invasive woody species, herbiciding problem vegetation such as reed canary grass, stream bank grading, in-stream habitat restoration, and restoration of native ground-layer vegetation along Nippersink Creek. This restoration work will dramatically increase the area of suitable smooth green snake habitat in Glacial Park.

Timeline:

To Date: The geographic location of 14 different populations of smooth green snakes on seven different sites have been identified and mapped within the past two years. At this time, sixteen young smooth green snakes are being head-started at an off-site facility and are scheduled for release in late spring of 2015. The locations for the surveys to be conducted have been researched and identified.

November 2015 – March 2016:

1. Head-starting equipment will be purchased and set up in an on-site location, specifically The District's Wildlife Resource Center.
2. The field technician position will be posted and the hiring process will begin.
3. Field equipment will be ordered
4. Illinois Nature Preserve Scientific permits will be secured for the coming year

April 2016:

1. Cover boards will be purchased and placed onto sites

May- August 2016:

2. Actively surveying sites
3. Wildlife Resource Center will prepare for Head-starting program

September 2016:

1. Vegetation surveys at smooth green snake capture locations will be conducted

October 2016- March 2017:

1. Data will be processed including GIS mapping
2. Survey locations for 2017 field season will be evaluated
3. If gravid females are captured, the head-start program will be in progress
4. Potential head-started young release sites will be evaluated
5. Replacement equipment for 2017 field season will be ordered
6. Field technician position will be posted and the hiring process will begin for the following field season
7. Illinois Nature Preserve Scientific permits will be secured for the coming year

April 2017:

1. Replacement Cover boards will be purchased and placed onto sites

May- August 2017:

1. Actively surveying sites
2. Wildlife Resource Center will prepare for Head-starting program

September 2017:

1. Vegetation surveys at smooth green snake capture locations will be conducted

October 2017- March 2018:

1. Data will be processed including GIS mapping
2. If gravid females are captured, the head-start program will be in progress
3. Potential head-started young release sites will be evaluated

General:

(i) Substantial in Character and Design

The project statement describes a need consistent with the -State Wildlife Grants (SWG); states a purpose and sets objectives, both of which are based on the need; uses a planned approach, appropriate procedures and research; and is cost effective.

(ii) Compliance

The IDNR will use its CERP (Comprehensive Environmental Review Process) as a tool to aid the Department in meeting NEPA compliance for the project outlined under this grant proposal. It is the Department's policy to require CERP applications for all land disturbing activities unless those activities are covered by CERP exemptions.

All planned activities will also be in compliance with the Endangered Species Act. All determinations and documentation will be in accordance with the current established U.S. Fish and Wildlife Service protocols for section 7.

All planned activities will be in compliance with the National Historic Preservation Act and the Council on Historic Preservation Act. All determinations and documentation will be in accordance with the terms of the Programmatic Agreement, as amended, effective September 23, 2002.

When applicable, those planned activities which involve a floodplain and/or jurisdiction wetlands will be done in accordance with Presidential Executive Orders 11988 and 11990.

When applicable, those planned activities which involve programs and/or site improvements will be done in accordance with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act.

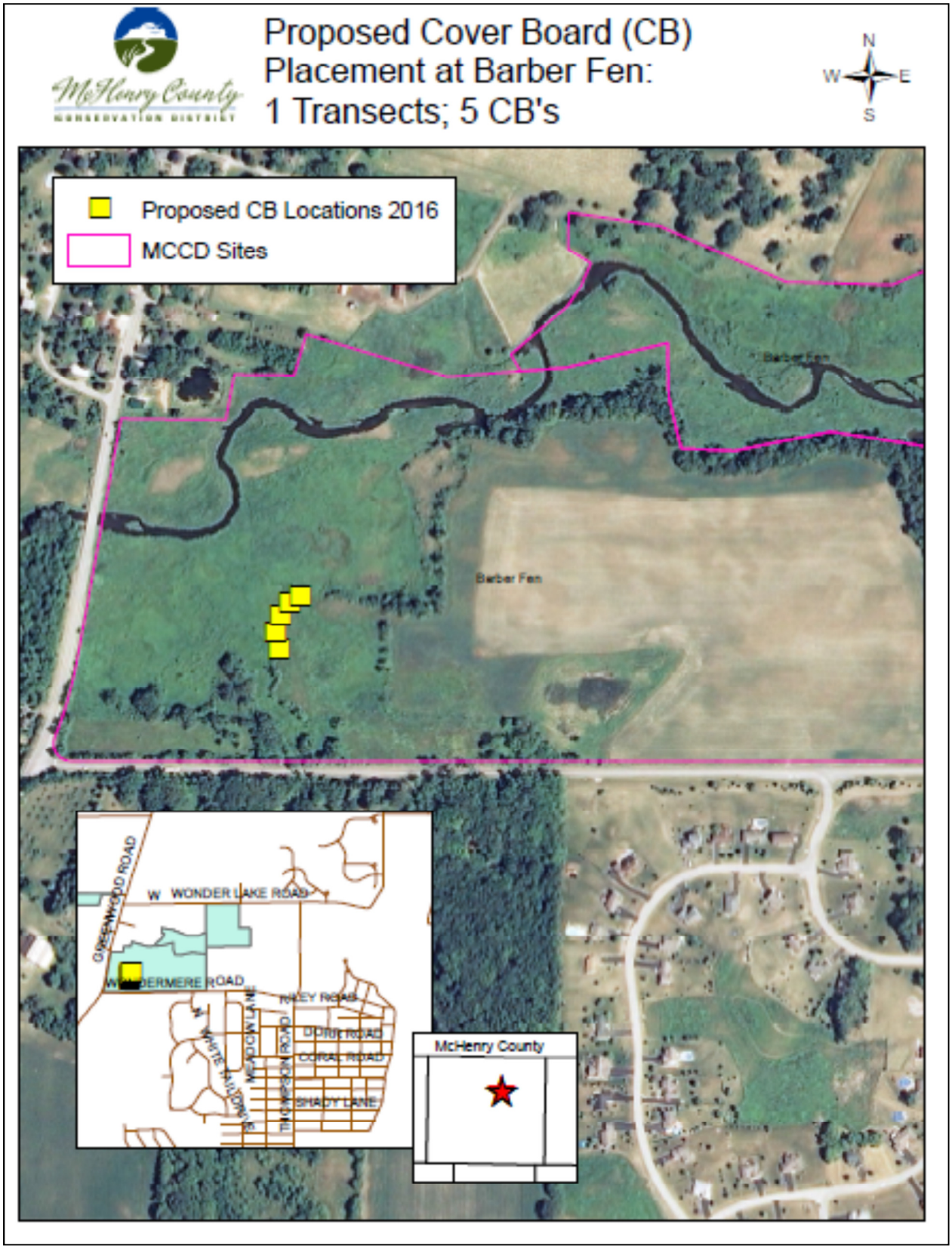
When applicable, those planned activities which involve the use of pesticides, herbicides or other comparable chemicals will be done in accordance with current state and federal regulations to assure the safe and legal application of those chemicals. All chemicals will be applied in accordance with the manufacturers label instructions. All persons applying chemicals will be licensed by the Illinois Department of Agriculture as a chemical operator along with a licensed applicator, in accordance with Illinois state law.

Literature Cited:

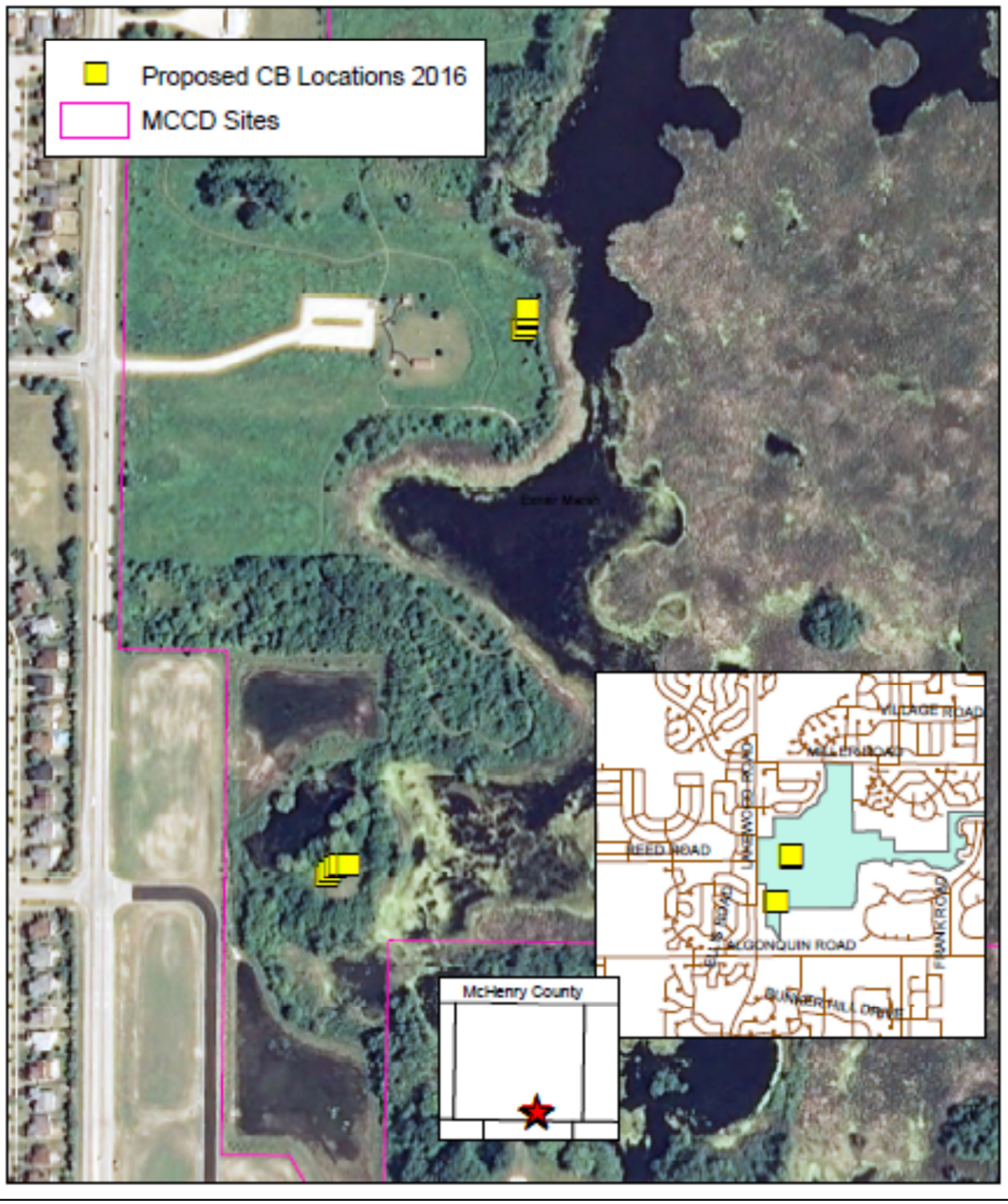
Sacerdote-Velat, A. B., Earnhardt, J. M., Mulkerin, D., Boehm, D., & Glowacki, G. (2014). Evaluation of headstarting and release techniques for population augmentation and reintroduction of the smooth green snake. *Animal Conservation*, *17*(S1), 65-73.

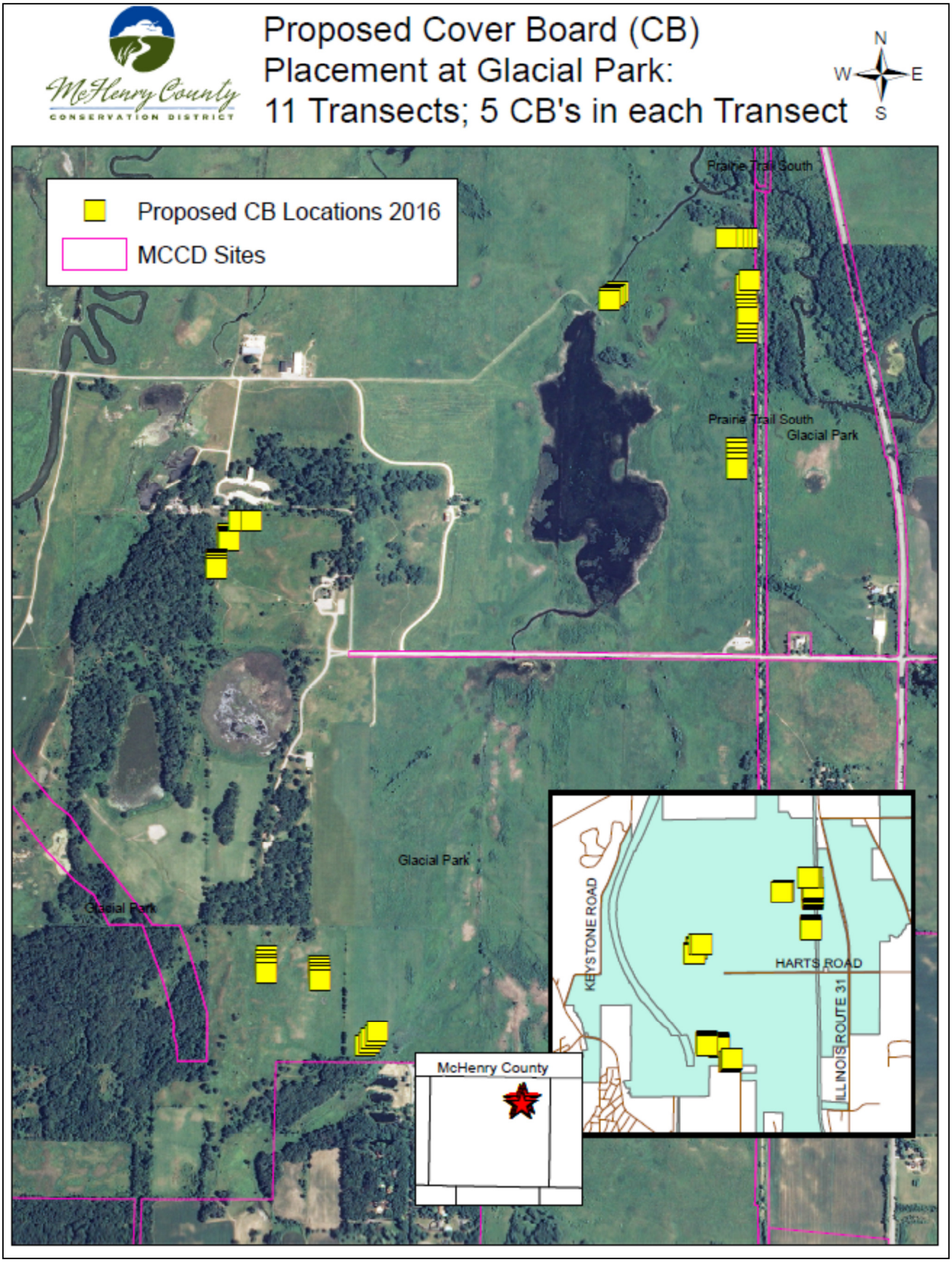
Tuberville, T.D., Clark, E.E., Buhlmann, K.A. & Gibbons, J.W. (2005). Translocation as a conservation tool: site fidelity and movement of repatriated gopher tortoises (*Gopherus polyphemus*). *Animal Conservation*, 8, 349-358.

Appendix A: Detailed Maps of Potential Survey Sites and Transect Locations

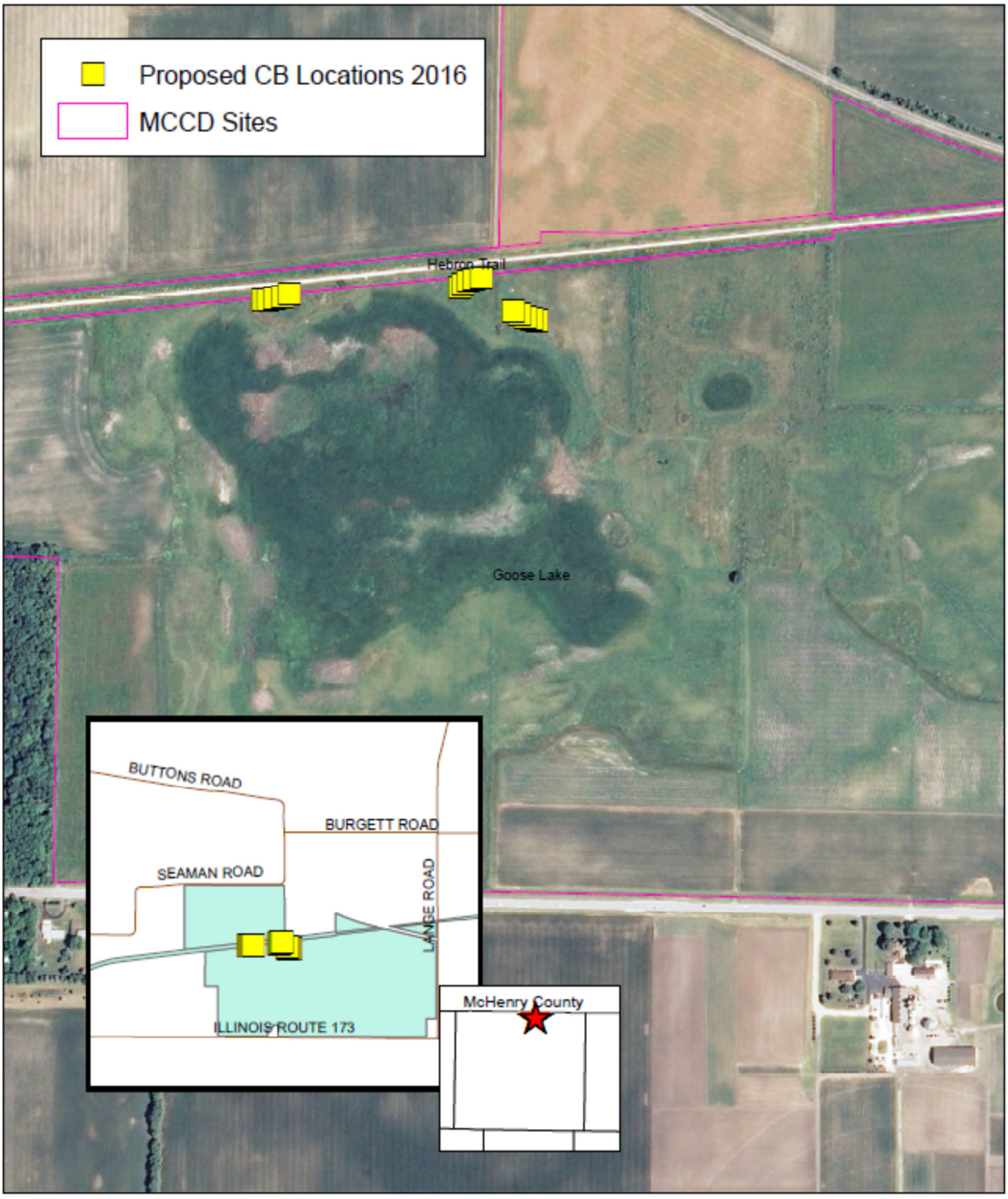

McHenry County Conservation District
Proposed Cover Board (CB) Placement at Barber Fen:
1 Transects; 5 CB's
N
W
E
S
Proposed CB Locations 2016
MCCD Sites
Barber Fen
W WONDER LAKE ROAD
GREENWOOD ROAD
WINDERMERE ROAD
RILEY ROAD
DORIS ROAD
CORAL ROAD
SHADY LANE
McHenry County

Proposed Cover Board (CB) Placement at Exner Marsh: 2 Transects; 5 CB's in each Transect

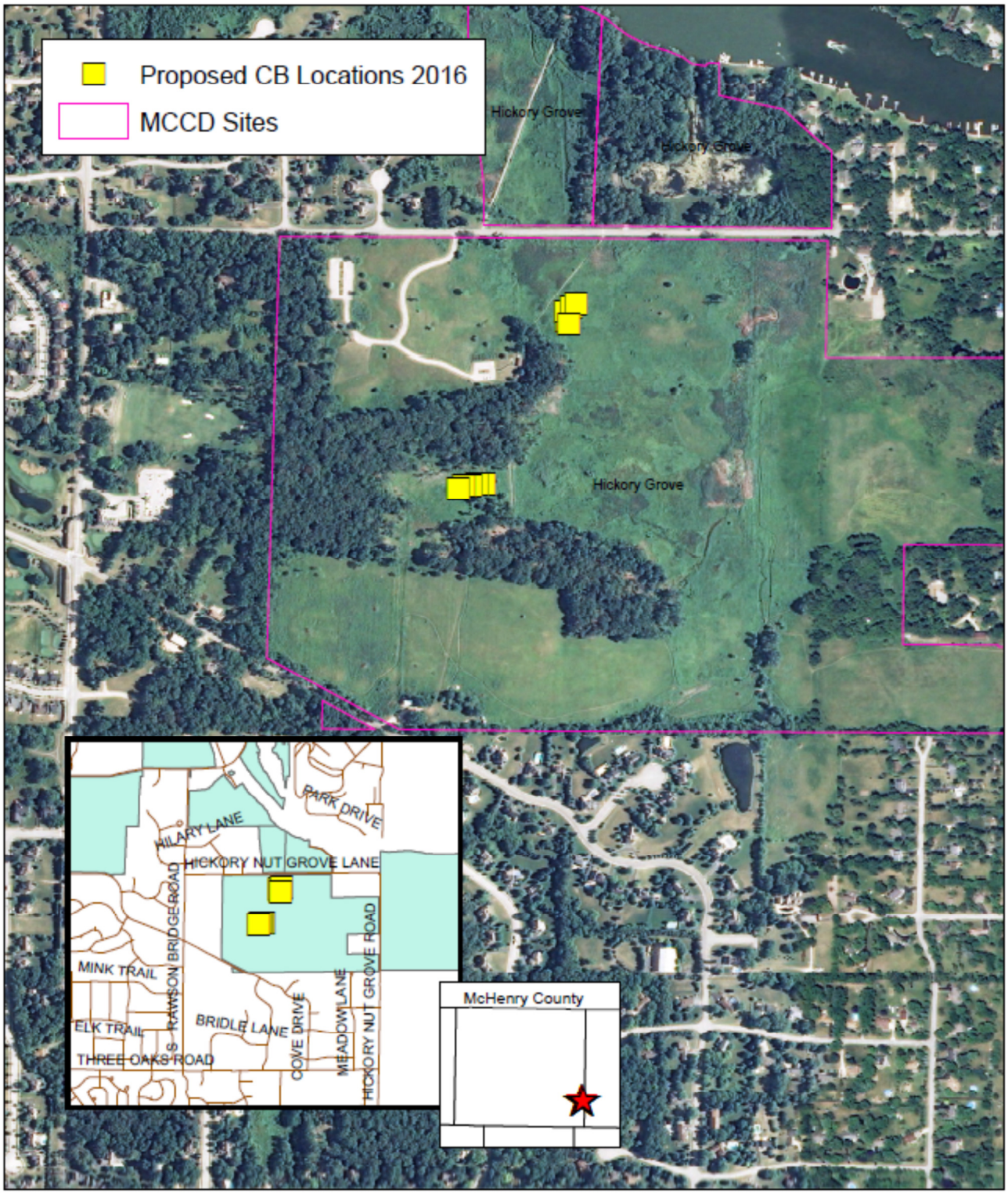



Proposed Cover Board (CB)
Placement at Glacial Park:
11 Transects; 5 CB's in each Transect
McHenry County
CONSERVATION DISTRICT
N
W
E
S
Proposed CB Locations 2016
MCCD Sites
Prairie Trail South
Prairie Trail South
Glacial Park
Glacial Park
Glacial Park
KEYSTONE ROAD
HARTS ROAD
ILLINOIS ROUTE 31
McHenry County

Proposed Cover Board (CB) Placement at Goose Lake: 3 Transects; 5 CB's in each Transect



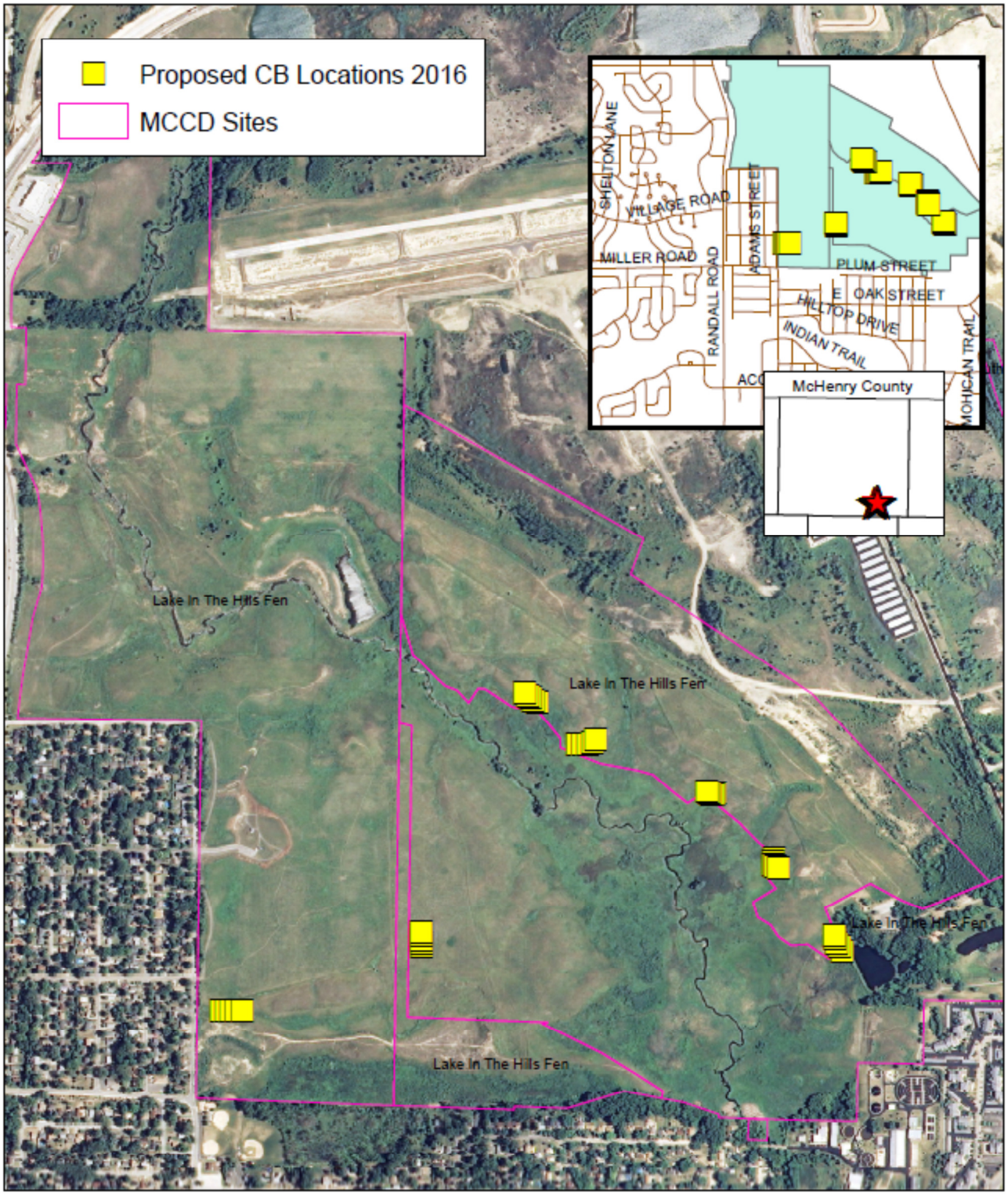
Proposed Cover Board (CB) Placement at Hickory Grove: 2 Transects; 5 CB's in each Transect



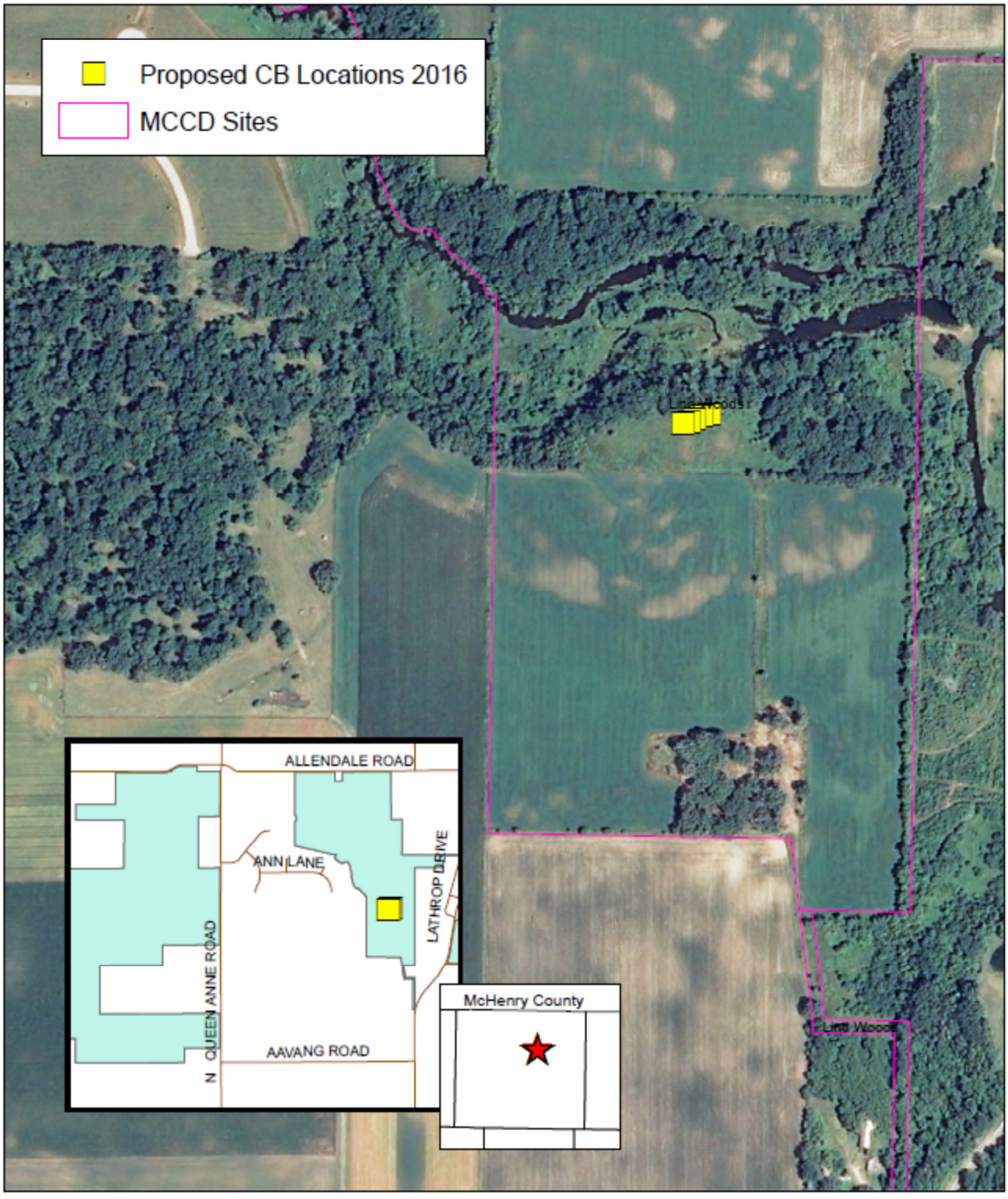
Proposed Cover Board (CB) Placement at Larsen Prairie: 1 Transects; 5 CB's

Proposed Cover Board (CB) Placement at Lake in the Hills Fen: 7 Transects; 5 CB's in each Transect

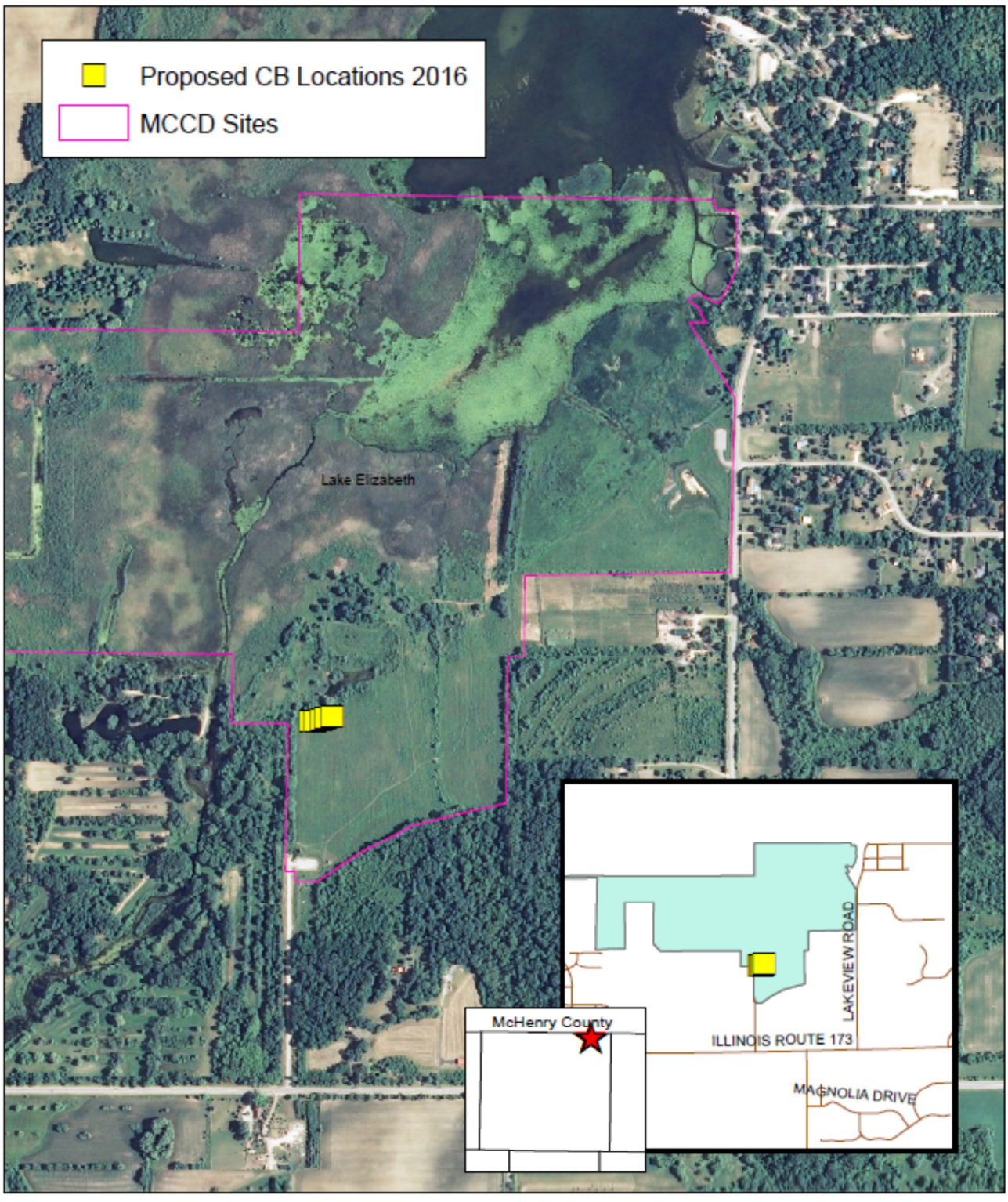
McHenry County Conservation District



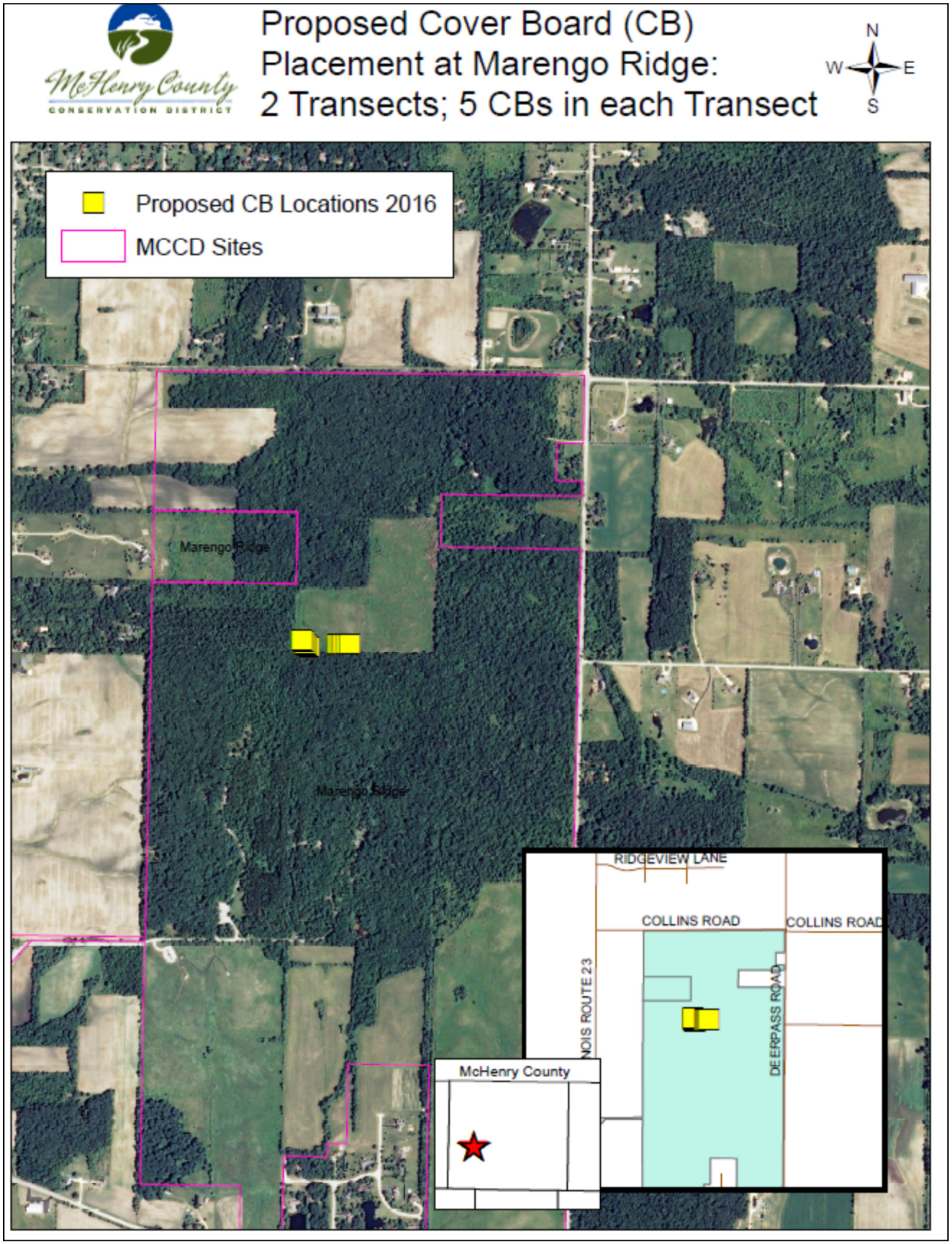
Proposed Cover Board (CB) Placement at Lind Woods: 1 Transects; 5 CB's



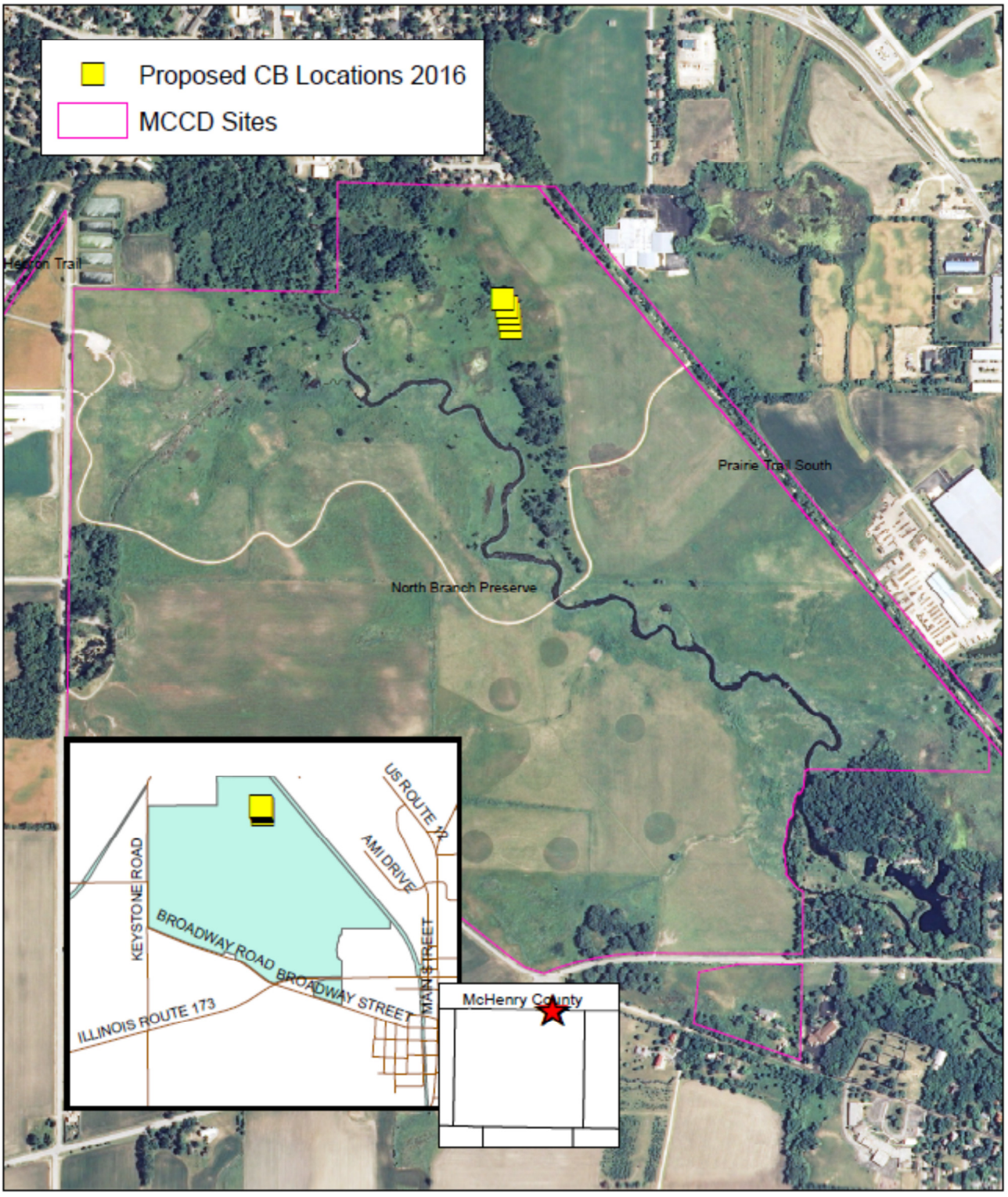
Proposed Cover Board (CB) Placement at Lake Elizabeth: 1 Transects; 5 CB's



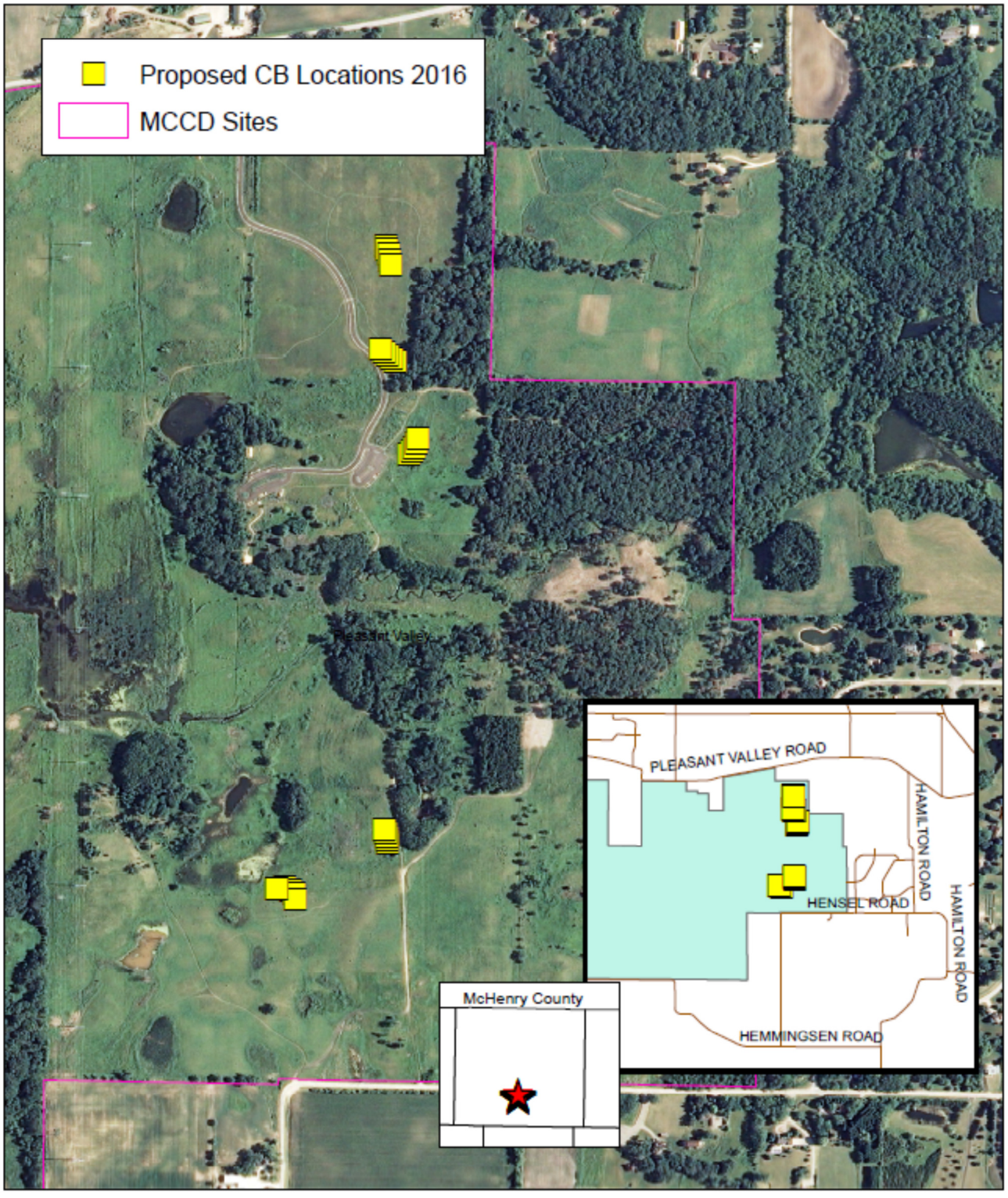
Proposed Cover Board (CB) Placement at Marengo Ridge: 2 Transects; 5 CBs in each Transect



Proposed Cover Board (CB) Placement at North Branch Preserve
1 Transects; 5 CB's



Proposed Cover Board (CB) Placement at Pleasant Valley: 5 Transects; 5 CB's in each Transect



Proposed Cover Board (CB) Placement at Silver Creek: 2 Transects; 5 CB's in each Transect

McHenry County Conservation District